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Economic Impact of a Proposed Regulation Deleting the Dissolved Iron Standard, R76-21

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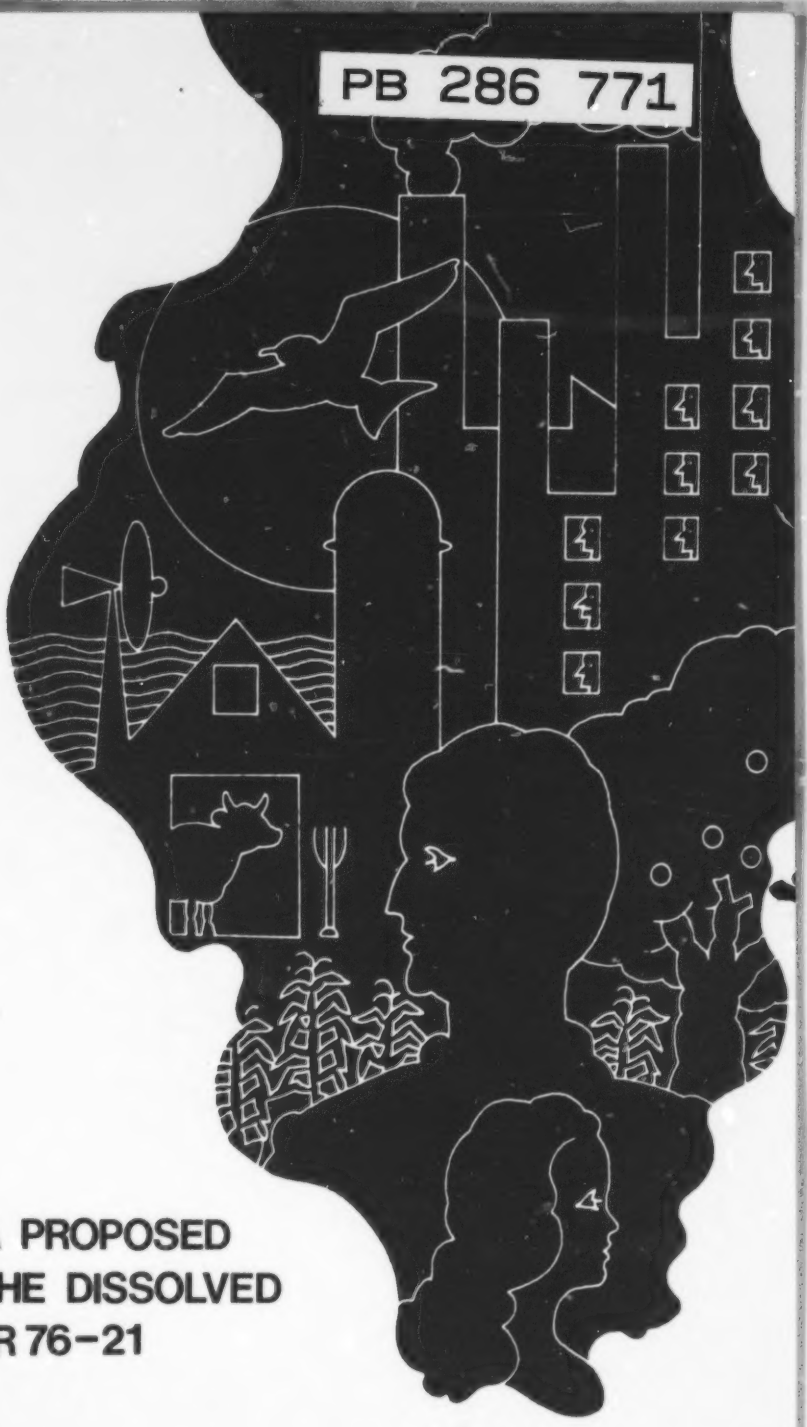

ECONOMIC IMPACT OF A PROPOSED REGULATION DELETING THE DISSOLVED IRON STANDARD, R 76-21

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Among several proposed amendments to the Illinois Pollution Control Board Water Pollution Regulations (Chapter 3) requested by the Illinois Institute for Environmental Quality on November 23, 1976 (PCBR76-21), is a proposal to delete the current dissolved iron effluent standard of 0.5 mg/l from Rule 408(a) (5). The recommendation was proposed by the Illinois Effluent Standards Advisory Group (IESAG) in the document Evaluation of Effluent Regulations of the State of Illinois (12)

This study will address the extent to which point sources contribute to total and dissolved iron in Illinois waterx, and review the environmental concerns of excessive concentrations of dissolved and total iron.

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Opinion of the Economic Technical Advisory Committee
of the Illinois Institute for Environmental Quality

The Economic Technical Advisory Committee has reviewed the economic impact study, IIEQ Document No. 78/2, entitled Economic Impact of A Proposed Regulation Deleting the Dissolved Iron Standard, R76-21. The Committee finds the report to be generally responsive to the requirements of Section 6 of the Environmental Protection Act, and recommends that it be forwarded to the Pollution Control Board so that public economic impact hearings may be held in connection with proposed regulation R76-21, AMENDMENTS TO THE WATER POLLUTION REGULATIONS OF THE ILLINOIS POLLUTION CONTROL BOARD.

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SUMMARY

Contained in proposed rule change R76-21, currently before the Illinois Pollution Control Board, is a recommendation to delete the 0.5 mg/l dissolved iron effluent standard from Rule 408 (a) of the Chapter 3, Water Pollution Regulations. The Illinois Effluent Standards Advisory Group has recommended the deletion of this standard on the basis that it is a redundant standard, since total iron is also regulated. The total iron effluent standard is 2.0 mg/l.

The major benefit of the proposed change would be a simplification of the current standards. No significant environmental benefits or costs could be identified should the proposed standard deletion be approved. Based on solubility data, only when a waste has a pH below 3.7 or contains iron in the reduced ferrous state would the dissolved iron standard be more restrictive than the existing 2.0 mg/l total iron standard.

In those few industries where iron control is a problem, and particularly if a chelating material might be present in a waste stream, the dissolved iron test could be useful from a process control point of view. In such cases the Agency could request appropriate tests when identifying monitoring reporting requirements.

Non-point sources, rather than effluents, contribute the greatest amount of iron to Illinois waters. A major source of iron is contained in the runoff from abandoned coal mine areas of the state. Biological surveys confirm the environmental harm resulting from deposition of iron oxide on stream bottoms as a result of past mining activities (7).

The cost of controlling pollution from this source has been estimated at 346 million dollars (7). Non-point sources are not part of this regulatory proposal.

Because deleting the 0.5 mg/l dissolved iron standard would have a negligible effect on dischargers to Illinois waters, there would be no significant impact on any sector of the Illinois economy -- agriculture, government or commerce and industry.

Adoption of the proposed rule change could have a secondary benefit with respect to availability of employment, cost and availability of goods and services. Although not possible to quantify, a state that willingly eliminates an unnecessary regulatory requirement would gain respect of industries which might be considering expansion or creation of manufacturing operations in Illinois.

CHAPTER I

INTRODUCTION

Among several proposed amendments to the Illinois Pollution Control Board Water Pollution Regulations (Chapter 3) requested by the Illinois Institute for Environmental Quality on November 23, 1976 (PCBR76-21), is a proposal to delete the current dissolved iron effluent standard of 0.5 mg/l from Rule 408(a) (5). The recommendation was proposed by the Illinois Effluent Standards Advisory Group (IESAG) in the document Evaluation of Effluent Regulations of the State of Illinois (12). In that document, the Advisory Group states:

> The Illinois standard for dissolved iron is 0.5 mg/l. No other state regulates dissolved iron. The U.S. EPA guidelines do not include a dissolved iron parameter. The inclusion in the Illinois regulations of standards for both total iron and dissolved iron is inconsistent with other parameters regulated. IESAG recommends that Rule 408 parameter, Iron (dissolved) be deleted.

The proposed deletion of the 0.5 mg/l dissolved iron standard in the effluent regulations would also be incorporated in the changes to the Water Pollution Regulations (Chapter 3) proposed by the Illinois Environmental Protection Agency on May 9, 1977 (R77-12) with respect to SECTION IV, WATER QUALITY STANDARDS (SECONDARY CONTACT) Rule 205(e) (6). That is, if dissolved iron is omitted as a measured parameter from the effluent standards, it would also be omitted from the water quality standards governing Restricted Use Waters.

The major benefit of the proposed change would be to streamline

the Illinois Water Pollution Control Regulations by elimination of what appears to be a redundant standard. The IBSAG recommends that the effluent standard for total iron be maintained at the current value of 2.0 mg/l. The usual rapid conversion of Fe^{+2} to Fe^{+3} and the insolubility of ferric hydroxide indicate that little dissolved iron would be expected to occur in an effluent that meets the current pH requirements of 5-10 (even less in the range of 6-9 that is a recommended change also included in R76-21).

The dissolved iron paramater is not being utilized to any significant extent by the Illinois EPA in their effluent and water quality monitoring programs. From April 1975 to April 1976 only six effluent samples are reported. During 1976 only four water quality samples were analyzed for dissolved iron (Table 1). The Illinois State Water Survey reports iron analyses on a total iron (unfiltered sample) basis (7). Thus, since there is little monitoring for dissolved iron in effluent standards, there is little potential for saving by deleting the requirement.

This study will address the extent to which point sources contribute to total and dissolved iron in Illinois waters, and review the environmental concerns of excessive concentrations of dissolved and total iron.

CHAPTER 2

REVIEW OF CURRENT AND ANTICIPATED ENVIRONMENTAL CONSEQUENCES

The relative significance of dissolved iron compared to total iron when present in wastewater effluents and its resultant behavior in receiving waters is related to the solubility characteristics of the Ferrous (Fe^{+2}) and Ferric (Fe^{+3}) ionization states of the element. Figure 1 presents the solubility of ferrous hydroxide, $Fe(OH)_2$ and ferric hydroxide, $Fe(OH)_3$ as a function of pH over the pH range of concern. These relations were calculated based on the solubility product constants for these compounds at 18°C (10):

$$Fe(OH)_2 = Fe^{+2} + 2\ OH^-$$

$$Ksp = [Fe^{+2}]\ [OH^-]^2 = 1.64 \times 10^{-14}$$

$$Fe(OH)_3 = Fe^{+3} + 3\ OH^-$$

$$Ksp = [Fe^{+2}]\ [OH^-]^3 = 1.1 \times 10^{-36}$$

where concentrations are expressed in units of g-mole/l.

Inspection of Figure 1 leads to the following conclusions:

1. Iron in the ferric form is extremely insoluble. Only pH values below 3.7 should result in dissolved iron concentrations in excess of the current 0.5 mg/l standard.

2. Iron in the ferrous form is more soluble. According to Figure 1, dissolved iron values above 0.5 mg/l could exist at pH values below 9.6.

3. From the above, and given the existing standard of 2.0 mg/l total iron, it may be concluded that the deletion of the 0.5 mg/l dissolved iron effluent standard represents a relaxation of the standard only for effluents that contain ferrous iron.

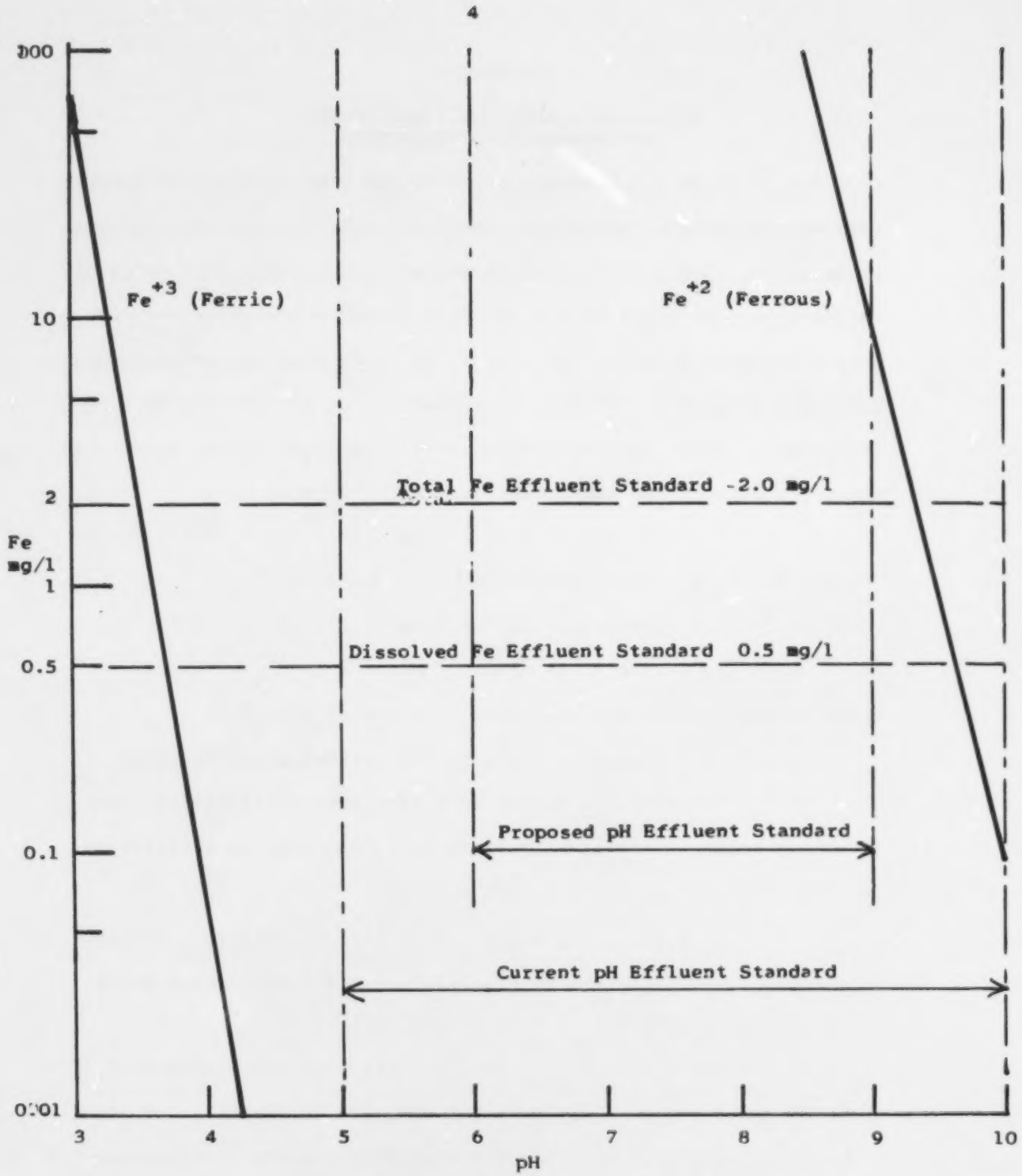

Figure 1. Solubility of Ferrous and Ferric Hydroxides

Since there is no anticipated change in the 2.0 mg/l total iron standard, the elimination of the dissolved iron standard would, in effect, allow higher dissolved iron concentrations (up to an additional 1.5 mg/l) only when the iron is present in the reduced (ferrous) form. Soluble ferrous iron at neutral pH and in the presence of oxygen is rapidly oxidized to the insoluble ferric form. Below a pH of 6 the oxidation rate is extremely slow (11).

Thus, on a theoretical basis, the deletion of the dissolved iron standard would represent a minor relaxation of the current standard. In some real systems, including some industrial wastes where chelating agents are present, there could be a decreased or delayed precipitation of dissolved iron. Under such circumstances, it is possible that measured values of dissolved iron may exceed the theoretical value at a given pH. For example, when a raw water supply is high in dissolved iron, sodium hexametaphosphate (a chelating agent) is sometimes added to retard formation of colloidal iron which causes turbidity in the finished water (14).

Natural waters high in organic content may be high in dissolved iron due to the chelating action of the organic material. This chelated form of dissolved iron is not readily precipitated by aeration or increased pH of the water (2).

The absolute limit of 2.0 mg/l total iron effluent standard would safeguard against dissolved iron exceeding more than four times the current standard.

Dissolved iron levels of 2-5 mg/l can result in groundwater supplies when carbon dioxide concentrations reach 30-50 mg/l. Under anaerobic conditions the formation of ferrous bicarbonate can result in soluble iron in the 2-5 mg/l range (14).

High concentrations of soluble iron can result in surface waters when anaerobic conditions exist near the bottom of lakes and ponds. The lack of oxygen, together with generally lower pH conditions, can cause release of ferrous iron from the bottom sediments (13). When mixed with top surface waters of higher pH and containing dissolved oxygen, re-precipitation of the iron occurs as ferric hydroxide.

High soluble iron can result from mining activities, principally coal mining, that produce low pH in the runoff or discharge water from the mine site. When iron pyrite is exposed to air under moist conditions, dissolved iron and sulfuric acid are formed with the aid of sulfur-oxidizing bacteria, according to the reaction (15):

$$FeS_2 + 3\tfrac{1}{2}O_2 + H_2O \rightarrow FeSO_4 + H_2SO_4$$

pH values below 4 and dissolved iron in the hundreds of thousands can result in streams receiving runoff from surface or underground mine sites and/or mine refuse piles. Table 3 summarizes some data from Illinois streams subject to acid mine drainage obtained from the US EPA Storet system data bank.

In addition to the solubility characteristics of the ferrous and ferric iron forms, the rate of conversion from ferrous to ferric iron is an important consideration. For example, ferrous bicarbonate present in some groundwaters may oxidize to the insoluble ferric form in less than ten minutes or may require several hours for

completion, depending on the pH and degree of aeration. pH values above 7 favor rapid and complete oxidation (2).

Justification for the Current Standard

Review of the Illinois Pollution Control Board records of 1971-1972, together with personal communication with some of those testifying at the hearings where the dissolved iron standard was considered (J.W. Patterson, R.F. Weston, and W. Dodge), failed to disclose any major justification for maintaining the current standard. The fact that industrial discharges could, generally, attain the 0.5 mg/l dissolved iron value by commonly available treatment techniques meant there was little testimony in opposition to establishment of the dissolved iron standard. Aeration and pH adjustment to a neutral range readily oxidizes ferrous iron to the insoluble ferric form. Solids separation then removes iron from the effluent. Treatment techniques and costs are presented by Patterson in the IIEQ document Technology and Economics of Industrial Pollution Abatement and will not be elaborated on here (11).

Effluent Data Evaluation

A computer search of IEPA sampling data reporting dissolved iron over the period 4/8/75 to 8/2/76 disclosed only six effluent samples and four stream samples where dissolved iron had been reported. Table 1 presents these data.

Table 1
IEPA Data for Dissolved Iron
4/8/75 to 8/2/76

Source	Fe(dissolved) mg/l	Fe(total) mg/l	pH
Effluent Data			
ERA	0	--	8.2
QH	0.01	0.9	8.0
JN	0.05	1.8	8.0
JS	3.1	212	6.4
GI	0	0.1	8.0
P	0	0.2	8.4
Water Quality Data			
EOH 01 Basin Sangamon River South Fork	0.17	--	8.1
NE 03 Basin Big Muddy River Little Muddy River	0.01	3.4	7.3
OCO2 Basin Kaskaskia River Richland Ck-South	0	1.0	7.7
QOO1 Basin Lake Michigan North Av-Linc Pk	0.02	0	8.5

Only one dissolved iron value, a steel company effluent, exceeded the 0.5 mg/l standard. That sample, reported at 3.1 mg/l dissolved iron, contained 212 mg/l total iron -- more than 100 times the effluent standard. At the reported pH of 6.4, it is likely the oxidation from the ferrous to the ferric ionic state had not gone to completion, resulting in some soluble ferrous iron in the effluent.

Due to the lack of data on dissolved iron from effluent samples, an analysis was made of the effluent data available for the total iron parameter (on the basis that dissolved iron could not exceed the standard unless total iron also exceeded the standard). A computer search utilizing IEPA effluent data obtained during the 1976 calendar year provided the following information:

1. Forty-seven of the grab samples taken during the year indicated total iron values equal to or exceeding 4.0 mg/l -- twice the effluent standard of 2.0 mg/l total iron.

2. The 47 samples with total iron equal or greater than 4.0 mg/l represented 23 different dischargers.

3. Of these 23 discharges, the 1976 calendar year average values exceeded 4.0 mg/l for 9 of the dischargers and 2.0 mg/l for 19 of them.

Table 2 presents a summary of the 19 dischargers, ordered by magnitude of the average total iron discharge, where the 1976 average value exceeded 2.0 mg/l. The IEPA Water Quality Management Basin Plan Phase 1 provided, in most cases, information on the nature of the discharge source, average discharge flow and 7-day-10 yr low flow of the receiving stream. Since the Basin Plans were prepared with discharge permit data available through 1975, and 1976 data

Table 2
Summary of Dischargers Whose 1976 Average
Value for Total Iron Exceeded 2.0 mg/l
(and having one or more values in excess of 4.0 mg/l)**

	Discharge type*	pH	Average Total Fe, mg/l	Number of Samples	Discharge Avg. flow MGD	7-day, 10 yr low flow of receiving stream cfs
1	S&M	5.5	49.5	8	3.5	0
2	STW	7.0	45.2	5	12.75	46,000
3	O	2.6	35.0	1	0.2	0
4	STW	2.5	22.9	5	14.1	46,000
5	S&M	8.8	12.9	5	---	---
6	O	8.6	6.7	2	---	0
7	S&M	7.6	5.1	1	---	---
8	S&M	8.2	4.7	3	---	---
9	O	8.6	4.7	1	0.9	0
10	O	8.3	4.1	9	0.005	0
11	S&M	7.9	3.8	4	---	0
12	STW	8.0	3.8	3	1.0	431.8
13	STW	7.1	3.7	10	5.5	15,940
14	O	9.1	3.3	4	---	---
15	S&M	8.0	3.3	2	---	---
16	S&M	8.0	2.7	10	---	2,954
17	PP	7.9	2.4	10	150.0	3,125
18	O	8.3	2.1	5	0.06	---
19	O	3.4	2.1	12	0.15	0

*Characterization of Discharge — number

S&M = Steel and Metals works	7
STW = Sewage Treatment Works	4
PP = Power Plant	1
O = Other	7
Total	19

**Based on IEPA effluent data for 1976 (grab samples).

were analyzed for this study, there were a few discharges where permit data were not available from that source.

Of the data available, five of the discharges enter large rivers with flows in excess of 3,000 cfs. The dilution afforded in these streams indicates that little effect, beyond the mixing zone, would be anticipated in the total dissolved iron present in the stream. Six of the discharges enter zero flow streams. For these discharges the total iron in the stream would, at times, be equal to that of the effluent discharge.

The first column in Table 2 indicates the types of discharger responsible for high total iron values. It should be noted that the data presented in Table 2 was based on a limited number of grab samples, and may not be representative of the 24-hour, composite sample values that might be obtained on a given discharge.

Evaluation of Water Quality Data

Total Iron Data

The total iron water quality standard in Illinois is 1.0 mg/l. There is no dissolved iron standard except for restricted use waters, where the effluent standard for dissolved iron (currently 0.5 mg/l; proposed -- no standard) would apply. As previously stated, the lack of dissolved iron data makes it necessary to use total iron data as an indicator of dischargers that could have a dissolved iron problem.

The IEPA Illinois Water Quality Inventory Report 1976 (7) analyzed total iron data from IEPA, the Illinois State Water Survey and other sources. Violations of the 1.0 mg/l total iron water quality standard occurred in all Illinois basins during 1975. Further, the

report states that after all point sources are brought into compliance with respect to total iron, the 1.0 mg/l water quality standard will still be violated in all Illinois basins. Nienkerk and Flemal (9) give a state-wide, discharge-weighted mean concentration of 2.9 mg/l total iron in Illinois streams, and calculate a state-wide, area-weighted average yield of 2.1 tons of iron/sq.mi./yr. All but one of 67 gaged stream sampling locations give frequency-weighted mean values in excess of the 1.0 mg/l standard.

The major iron containing streams are located in southern Illinois in the Kaskaskia, Big Muddy and Saline River Basins -- major coal mining areas of the state. Examination of Figure 2 shows no correlation between the location of the high concentration point sources and the location of the high iron content streams in the state.

Dissolved Iron Data

A request for dissolved iron water quality data for Illinois from the US EPA Storet system produced 2299 observations between 1/2/61 and 8/1/77, having a mean value of 1.063 mg/l. Examination of the data, which were taken at 507 sampling stations throughout the state, indicated a few stations reporting extremely high values, thus contributing greatly to the overall average. There were 8 sampling stations with reported average values over 5.00 mg/l. Elimination of these eight stations from the overall state average reduced the average by a factor of ten, to 0.10 mg/l dissolved iron.

Table 3 presents the average and maximum values of dissolved iron at 6 of the 8 stations that were deleted. Investigation of the other two stations (Canton, MO and Cape Girardeau, MO on the Mississippi River) disclosed neutral pH values on the high iron samples; a data coding error is suspected.

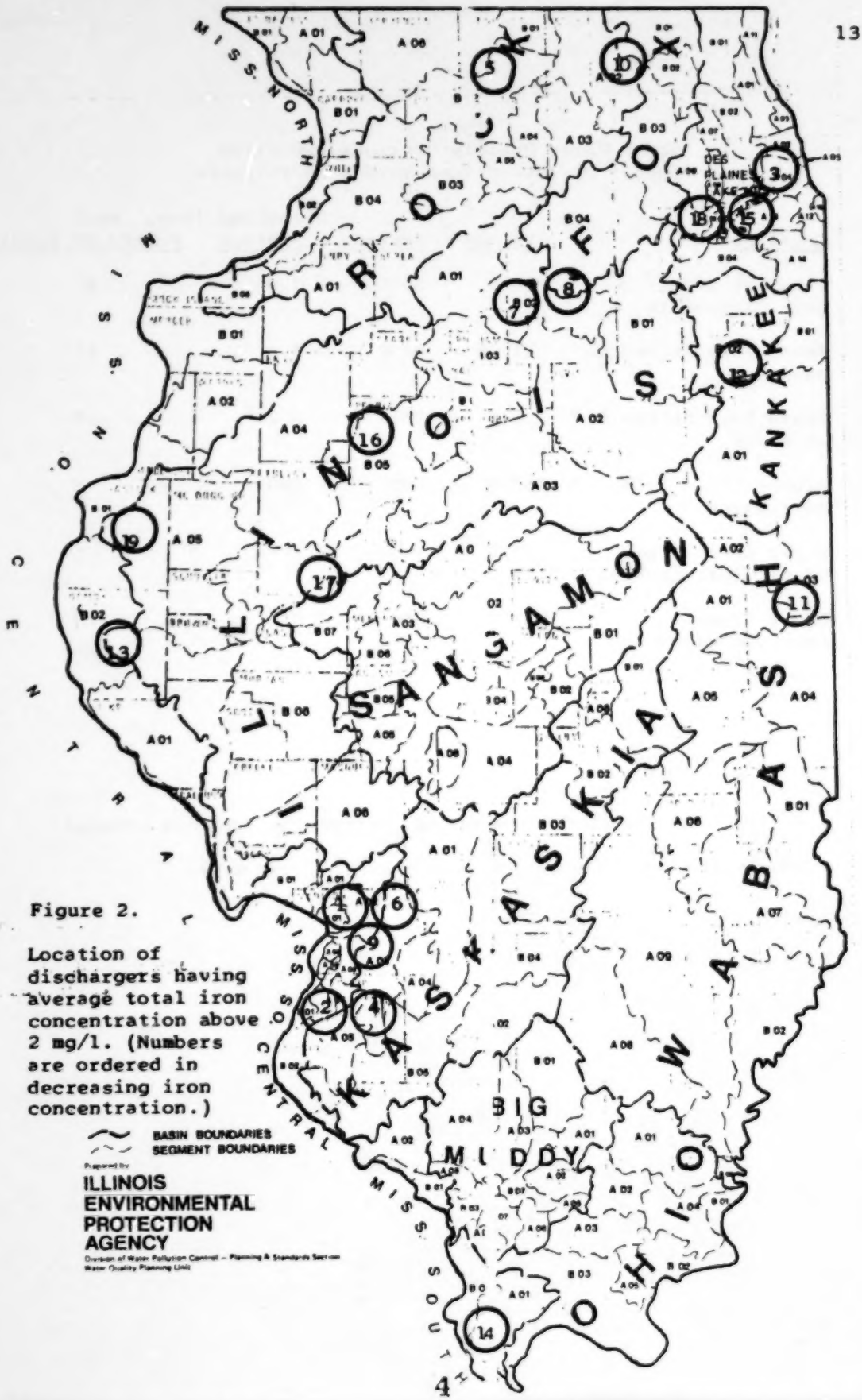

Figure 2.

Location of dischargers having average total iron concentration above 2 mg/l. (Numbers are ordered in decreasing iron concentration.)

Table 3
The 6 Water Quality Stations Reporting
Highest Dissolved Iron Values in Illinois

Location	Dissolved Iron, mg/l Average	Maximum	Minimum	Number of Samples
Sycamore Creek near Carbondale	14.5	26.0	0.05	6
South Fork Saline R. near Car	13.06	44.0	0.4	11
South Fork Saline R. at Mitch	6.6	25.0	0.2	6
Brushy Creek Trib. near Harco	260.0	340	180	2
Sugar Creek 5 mi. NE of Creal Springs	8.9	----	----	1
Sugar Creek near Stonefort	147.0	780	3.7	8

Clearly, the major iron concentrations in Illinois streams occur in the southern coal mining region of the state.

Behavior of Iron in the Environment

Health Effects

Iron in trace amounts is essential for human nutrition. Its function in oxygen transport by blood hemoglobin is commonly recognized. Iron overload occurs in idiopathic hemochromatosis, but a more prevalent disease is iron deficiency anemia (3). The recommended limit of 0.3 mg/l total iron for domestic water supplies given in the 1962 Drinking Water Standards of the USPHS is also the criteria given in the US EPA document Water Quality Criteria (17) and in the document of that name authored by McKee and Wolf (8). These limits are not based on physiological reasons, since the intake through drinking water at this level would contribute only a small fraction of the 16 mg/l average daily consumption in the total diet (8). The limit is based on esthetic and taste considerations. Higher concentrations of iron tend to precipitate excessive quantities of iron hydroxides, resulting in turbid water and stained laundry and porcelain fixtures in the home.

Studies evaluating threshold taste values for iron indicate a wide variability between individuals, moreso than other heavy metals (1). Cohen et al utilized a panel of 15-20 judges to evaluate the taste threshold of copper, iron, manganese and nickel in distilled water and in spring water. Precipitation of the ferrous sulfate was minimized in the iron tests by lowering the pH of the test solution to 5.0 and reducing the dissolved oxygen content to 0.2 ppm with nitrogen gas. The results of that study are given in Table 4 , where the results were interpreted in terms of the most probable levels at which 5% and 50% of the population would detect the presence

of the metal.

Table 4 (1)
Threshold Taste Levels for Iron

Compound	Threshold Frequency in Distilled Water		Threshold Frequency in Spring Water	
	5%	50%	5%	50%
	Iron concentration -- ppm			
Ferrous Sulfate	0.04	3.4	0.12	1.8
Hydrous Ferric Oxide	0.7	8.8	--	--

Although not a true solution, hydrated ferric oxide was used in evaluating the taste threshold of ferric iron.

The threshold concentration for iron was lower than that of any of the other metals studied, and exhibited the greatest variability. The least sensitive 5% of the panel could not detect 265 ppm iron in distilled water, indicating the perception of the iron by the most acute panel members was 6,400 times as sensitive as the least acute panelists. It was noted that the least sensitive panelists had, in general, been accustomed to drinking water containing substantial amounts of iron.

Effects in the Natural Environment

flora. Iron usually occurs in low concentrations in irrigation waters, and is of little concern (8). Chelated iron has been used to combat chlorosis in plants; large amounts of EDTA have been used in furnishing iron to fruit trees (a practice that may introduce a problem of toxic residues) (3).

One notable exception is a problem experienced in the 1969 tobacco crop in Florida (13). The affected leaves had a dark brown and purple spotted appearance, and sold for $0.25/lb, compared to $4.00/lb. for high quality cigar wrapper tobacco. The study traced the problem

to shallow irrigation ponds, which had a high iron content (10-12 ppm). Reducing conditions released iron from the bottom sediments. The reducing conditions were caused by:

1. high water temperatures
2. low dissolved oxygen
3. decaying vegetation at the pond bottom

Raising the pH and/or aerating the ponds was the recommended solution.

fauna - land animals. As in human health, iron is essential to animal diets. Animals are reported to be sensitive to changes in iron concentration. The milk production of cows has been reduced due to high iron content water discouraging normal water consumption (8).

fish and shellfish. Reported toxicity levels for iron are extremely variable in the literature, partly due to the lack of reporting pH and other environmental factors of many of the systems investigated (8). The iron in test systems is normally added as the chloride, sulfate or nitrate salt. If the system is not strongly buffered, the precipitation of the iron as ferrous or ferric hydroxide can reduce the pH to low levels which, by itself, has demonstrated toxic effects toward fish. Since pH is an important factor in determining the oxidation rate of ferrous iron with the resultant precipitation of ferric hydroxide, pH would be expected to affect the deposition rate of iron hydroxides on the gills of fish, an effect thought by many investigators to be the major toxicity mechanism of iron on fish. Convincing evidence that this is an important

mechanism is a study where soluble iron, in the form of ferrous disodiumversenate, was found not lethal to fingerling channel catfish after 96 hours at a concentration of 40 mg/l. Some investigators have reported levels well below 1 ppm of iron have been fatal for fish; others found a killing dose to be a week of exposure at 10,000 ppm (8).

Many investigations indicate toxicity effects in the 1.0 mg/l range; this is the recommended criteria in the US EPA Water Quality Criteria document.

In addition to direct toxicity, high iron content is a concern when ferric hydroxide or ferric oxide deposits heavily on stream bottoms, destroying bottom-dwelling invertebrates, plant life, and making the environment unsuitable for incubating fish eggs (17).

insects. Warnick and Bell studied the acute toxicity of some heavy metals to different species of aquatic insects (18). The metals tested (copper, zinc, cadmium, nickel, cobalt, chromium and mercury) were added as sulfate or chloride salts in the +2 valence state except for chromium, which was the trivalent form. The bioassay technique was performed at 18.5^{o}C and dissolved oxygen was maintained at 8.0 mg/l throughout the test. The dilution water had a pH of 7.25, alkalinity of 40.0 mg/l, and hardness of 44.0 mg/l. The three species of insects used were:

a stonefly (Plecoptera) Acroneuria lycorias
a mayfly (Ephemeroptera) Ephemerella subvaria
a caddisfly (Trichoptera) Hydropsyche betteni

These were chosen because they are widespread, easily collected and maintained in the laboratory, and important as fish food organisms.

Ephemerella was the most sensitive to all the metals; Table 5 summarizes the data with respect to this species (18).

Table 5
Toxicity of Metals Toward Ephemerella

metal	96 hr TL_m, mg/l (*except Cu, which is a 48 hr TL_m)
Cu	0.32*
Fe	0.32
Cd	2.0
Cr	2.0
Hg	2.0
Ni	4.0
Co	16.0

As with fish, the relative toxicity of the metals varies with the species. Note that iron is second only to copper in this insect toxicity study. The tests for iron utilizing acroneuria and hydropsyche gave 50% survival at 16.0 mg/l iron after 9 days and 7 days, respectively.

Effect on Recreation

fishing. To the extent that iron toxicity impacts on the fish population, fishing would be affected. In Illinois, the major impacted areas are those affected by acid mine drainage, particularly in the southern portion of the state.

swimming. Iron-containing waters are distasteful to swim in, and are usually avoided by swimmers when alternate locations are available. Reduced visibility can increase danger of drowning.

CHAPTER 3
BENEFITS

As established in Chapter 2, the proposed regulation change to delete the 0.5 mg/l dissolved iron standard will have little effect on the quality of water discharged in industrial or municipal effluents. The solubility characteristics of iron hydroxides, together with the 2.0 mg/l limitation for total iron coupled with pH limitations, indicate a nearly insignificant relaxation of the current effluent quality standards.

Nature of Benefits

Health, Ecological, Recreational and Aesthetic Considerations

The health, ecological, recreational and aesthetic effects of iron in the environment were discussed in Chapter 2. Since no significant changes in effluent and water quality would result from enactment of the proposed regulation change, no environmental benefit in these areas would ensue.

Reduction in Control Costs

The IEPA does not currently run the dissolved iron test but relies, as does the Illinois State Water Survey, on total iron for data on behavior of this element. A check of a half dozen of the current NPDES permits on those industries exhibiting high iron content in their effluent revealed only one that required monitoring and reporting of dissolved iron. Thus, economic benefit from reduced testing costs appears negligible.

Secondary Benefits

The most significant benefit from elimination of the 0.5 mg/l dissolved iron standard is a psychological one. In this age of ever

increasing government regulation in all areas of operation in the industrial and municipal sectors of the economy, the elimination of an existing regulation should be encouraging to industry within Illinois, and those contemplating activities in the state.

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STATE OF ILLINOIS)
) SS:
COUNTY OF COOK)

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BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

AMENDMENTS TO THE WATER POLLUTION)
)
REGULATIONS OF THE ILLINOIS) R76-21
)
POLLUTION CONTROL BOARD)

PETITION FOR AMENDMENTS TO
WATER POLLUTION REGULATIONS

The Illinois Institute for Environmental Quality (Institute) pursuant to Sections 1006 and 1028 of the Illinois Environmental Protection Act (Ill. Rev. Stat. ch. 111 1/2, Sections 1001 et seq., 1975) (Act) hereby petitions the Illinois Pollution Control Board (Board) to amend the Water Pollution Regulations (Chapter 3) to read as follows:

1. Amend Rule 401(c) of Chapter 3 to read as follows:

(c) Averaging.

Except as otherwise specifically provided in this Part, compliance with the numerical standards in this Part shall be determined on the basis of 24-hour composite samples averaged over any consecutive 30-day period. In addition no single 24-hour composite sample shall exceed two times the numerical standard prescribed in this Part nor shall any single grab sample taken individually or as an aliquot of any composite sample exceed five times the numerical standard prescribed in this Part. ~~In addition, no contaminant shall at any time exceed five times the numerical standard prescribed in this Part.~~

2. Amend Rule 408(a) of Chapter 3 to read as follows:

408 Additional Contaminants

(a) The following levels of contaminants shall not be exceeded by any effluent:

Constituent		Storet Number	Concentration (mg/l)
Arsenic	(total)	01002	0.25
Barium	(total)	01007	2.0
Cadmium	(total)	01027	0.15
Chromium	(total hexavalent)	01032	0.1 ~~0.3~~
~~Chromium~~	~~(total trivalent)~~	~~01033~~	~~1.0~~
Chromium	(total)	01034	1.0
Copper	(total)	01042	0.5 ~~1.0~~
~~Cyanide~~		~~00720~~	~~0.025~~
Cyanide	(total)	00720	0.1
Fluoride	(total)	00951	15.0
Iron	(total)	01045	2.0
~~Iron~~	~~(dissolved)~~	~~01046~~	~~0.5~~
Lead	(total)	01051	0.2 ~~0.1~~
Manganese	(total)	01055	1.0
Mercury	(total)	71900	0.003 ~~0.005~~
Nickel	(total)	01067	1.0
Oil	(hex. sol. or equiv.)	00550	15.0
pH	(Range)*	00400	6-9 ~~5-10~~*
Phenols		32730	0.3
~~Selenium~~	~~(total)~~	~~01145~~	~~1.0~~
Silver		01077	0.1
Zinc	(total)	01092	1.0
Total Suspended Solids (other than deoxygenating wastes as covered by Rule 404)		00530	15.0

* The pH limitation is not subject to averaging and must be met at all times.

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3. Amend Rule 408(b) of Chapter 3 by deletion, thereby renumbering Rule 408(c) to 408(b), the amendment to Chapter 3 to read as follows:

~~(b) Total Dissolved Solids (STORET number 00515) shall not be increased more than 750 mg/l above background concentration levels unless caused by receiving or other pollution abatement practices, and in no event shall exceed 3500 mg/l at any time.~~

(b) Compliance with the limitations of this Rule 408 shall be achieved by the following dates:

(i) With respect to mercury, by April 25, 1971;

(ii) With respect to all other specified contaminants,

(A) New sources shall comply on the effective date of this regulation;

(B) Existing sources shall comply by December 31, 1973.

4. Amend Rule 702 of Chapter 3 to read as follows:

702 Mercury (STORET number - 71900)

(a) No effluent to any public sewer system shall include mercury or any of its compounds in excess of 0.003 ~~.0005~~ mg/l as Hg at any time.

~~(b) The discharge of mercury shall be exempt from the limitations of paragraph (a) of this section if it meets all the following conditions:~~

~~(i) The total plant discharge totals less than five pounds as Hg in any year;~~

~~(ii) The discharge is to a public sewer served by a sewage treatment facility handling no less than 25,000 population equivalents;~~

~~(iii) The discharge does not alone, or in conjunction with other sources, cause the effluent from the sewage treatment plant to exceed 0.0005 mg/l as Hg; and~~

~~(iv) At least 95% of the mercury that would be discharged in the absence of control is removed from the effluent by December 1, 1971;~~

~~(v) After June 1, 1974 the exemptions provided in this subsection (b) shall terminate.~~

(b) ~~(c)~~ The discharge of wastes from medicinal or therapeutic use of mercury, exclusive of laboratory use, shall be exempt from the limitations of paragraphs (a) ~~and (b)~~ of this Rule ~~section~~ if all the following conditions are met:

(i) The total plant discharge is less than one half pound as Hg in any year;

(ii) The discharge is to a public sewer system; and

(iii) The discharge does not, alone or in conjunction with other sources, cause the effluent from the sewer system or treatment plant to exceed 0.003 ~~0.0005~~ mg/l of Hg.

(c) ~~(d)~~ No discharge of mercury shall be permitted which, alone or in combination with other sources, causes a violation of the water quality standard of 0.003 ~~0.0005~~ mg/l of Hg.

(d) ~~(e)~~ The discharge of mercury shall be exempt from the limitations of paragraph (a) of this Rule ~~section~~ if it meets all the following conditions:

(i) The discharger is a commercial laundry or cleaning service, as defined in classification No. 721, (except 7212 and 7215) of the Standard Industrial Classification Manual issued by the United State Government, Executive Office of the President, Office of Management and Budget.

(ii) In the aggregate, the soaps, cleaning compounds, processing chemicals or other materials added or used by the discharger do not contribute mercury to its effluent in violation of paragraph (a) of this Rule ~~section~~.

(iii) The discharger engages or participates in a program of ongoing research to develop a technically feasible and economically reasonable method for the treatment of mercury-containing wastes originating from industries referred to in paragraph (d) ~~(c)~~ (i) of this Rule ~~section~~.

(iv) The exemption provided in this paragraph ~~subsection~~ (d) ~~(c)~~ shall terminate after September 30, 1977.

JUSTIFICATION FOR PROPOSED
CHANGES TO RULES 401, 408, AND 702 OF CHAPTER 3

Justification of the above rule changes is contained in IIEQ Document No. 76/21 Evaluation of Effluent Regulations of the State of Illinois. This report represents the work of the Illinois Effluent Standards Advisory Group (IESAG) which was founded at the request of the Director of the Institute and whose deliberations covered the period October, 1975, through June, 1976. IESAG membership included: W. Wesley Eckenfelder, Vanderbilt University; Daniel J. Goodwin, IEPA; Roy F. Weston, Roy F. Weston, Incorporated; and James W. Patterson, Illinois Institute of Technology. Copies of the report of this distinguished group are attached as justification for this Petition; additional copies are available at the Institute Library.

WHEREFORE, the Illinois Institute for Environmental Quality requests that the Illinois Pollution Control Board, pursuant to Sections 1013 and 1028 of the Illinois Environmental Protection Act (Ill. Rev. Stat., ch. 111 1/2, Sections 1001 et seq., 1075) hold statewide public hearings for the purpose of hearing Institute testimony in support of its proposal.

RESPECTFULLY SUBMITTED,

ILLINOIS INSTITUTE FOR ENVIRONMENTAL QUALITY

By: Samuel G. Booras

Samuel G. Booras
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DATED: 23 November 1976

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